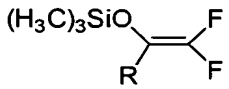
THE CLAIMS

What is claimed is:

1. A method for the synthesis of [^{18}F]-labeled trifluoromethylketones comprising the steps of

reacting [^{18}F]-F_2 with a silyl ether compound having the general formula 1



1

wherein R refers to an alkyl group having between 1 and 24 carbon atoms or an aryl group having between 6 and 24 carbon atoms under reaction conditions sufficient to form a [^{18}F]-labeled trifluoromethylketone.

2. The method of claim 1, wherein the alkyl or the aryl group comprises a ring.

3. The method of claim 1, wherein the alkyl group is substituted with at least one halogen, nitro, or alkoxy group.

4. The method of claim 3, wherein the alkoxy group has one to eight carbon atoms.

5. The method of claim 3, wherein the substituent does not participate in the reaction.

6. The method of claim 3, wherein the alkoxy is substituted with at least one substituents selected from the group consisting of an alkyl group having between 1 and 8 carbon atoms, a halogen, and an amino group, or any combination thereof.

7. The method of claim 1, wherein the condition sufficient to form a [^{18}F]-labeled trifluoromethylketone include a reaction temperature of between about -50°C to about -15°C.

8. The method of claim 1, wherein the [$^{18/19}$F]-F_2 is prepared by bombardment with [^{18}O]O_2 in a cyclotron and mixing with non-radioactive F_2.

9. The method of claim 1, wherein the [^{18}F]-F_2 mixture is bubbled into a solution comprising silyl ether compounds for about 5 to 15 minutes.

10. The method of claim 1, wherein the silyl ether is 2,2-difluoroenol silyl ether and further wherein the 2,2-difluroenol silyl ether is prepared by:

mixing magnesium, tetrahydrofuran, and chlorotrimethylsilane to form a reactant mixture;

cooling the mixture to between about -15° C to 5°C;

adding trifluoroacetophenone to the cooled mixture; and

stirring the mixture for about 0.5 to 1.5 hours to produce the difluoroenol silyl ether.

11. The method of claim 10, wherein the difluroenol silyl ether is 2,2-difluoro-1-phenyl-1-trimethylsiloxy-ethene.

12. The method of claim 1, which further comprises:

dissolving the silyl ether compound in acetonitrile to form a solution;

cooling the solution to about -50°to about -15°C;

preparing a mixture of [$^{18/19}$F]-F_2 and nitrogen; and

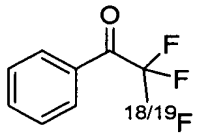
bubbling the mixture of [$^{18/19}$F]-F_2 and nitrogen into the solution for about 5 to 15 minutes to form a reaction mixture.

13. The method of claim 1, wherein the [^{18}F]-labeled trifluoromethylketones synthesized have a radiochemical purity greater than 99%.

14. The method of claim 1, wherein the [^{18}F]-labeled trifluoromethylketones that are synthesized have specific activities between about 15 to 20 GBq/mmol at the end of synthesis.

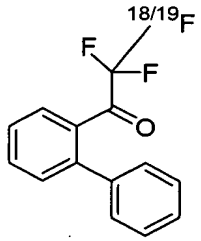
15. The method of claim 1, wherein the radiochemical yields of the [^{18}F]-labeled trifluoromethylketones are between about 45 to 55%.

16. The method of claim 1, wherein the [^{18}F]-labeled trifluoromethylketones synthesized has the following general formula 2a.



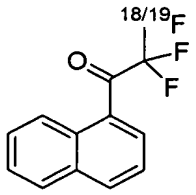
2a

17. The method of claim 1, wherein the [^{18}F]-labeled trifluoromethylketones synthesized has the following general formula 2b.



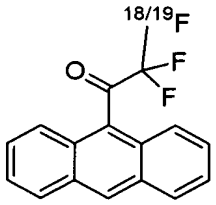
2b

18. The method of claim 1, wherein the [^{18}F]-labeled trifluoromethylketones synthesized has the following general formula 2c.



2c

19. The method of claim 1, wherein the [^{18}F]-labeled trifluoromethylketones synthesized has the following general formula 2d.



2d

20. An imaging agent comprising the [^{18}F]-labeled trifluoromethyl ketone of claim 1.

21. The imaging agent of claim 20, having a radiochemical purity of about 99% for use in positron emission tomography.

22. A marker for detecting cell proliferation or viral infections comprising the [^{18}F]-labeled trifluoromethyl ketone of claim 1.

23. The marker of claim 22, having a radiochemical purity of about 99%.